

311/01

BIOLOGY (MODULAR)

MODULE BI1

A.M. MONDAY, 2 June 2003

(1 hour 30 minutes)

For Examiner's Use Only

Total Marks	
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Centre Number

Candidate's Name (in full)

Candidate's Examination Number

INSTRUCTIONS TO CANDIDATES

Write your centre number, name and candidate number in the spaces provided above.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

The quality of written communication will affect the awarding of marks.

No certificate will be awarded to a candidate detected in any unfair practice during the examination.

1. Cells are classified as either prokaryotic or eukaryotic. The following table lists certain characteristics of both types of cell.

(a) Place a tick in the box or boxes in the table if the characteristic is present.

<i>Characteristic</i>	<i>Prokaryotic Cell</i>	<i>Eukaryotic Plant Cell</i>
Genetic material as chromosomes		
Ribosomes present		
Membrane bound organelles		
Respiration in mesosomes		

[4]

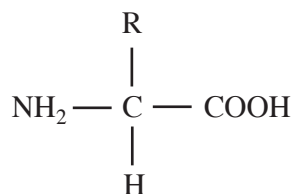
(b) State **one other** difference between a prokaryotic cell and a eukaryotic plant cell.

[1]

.....

(Total 5 Marks)

2. The diagram shows the structure of a biologically important molecule.



(a) State the name given to this general type of molecule.

[1]

.....

(b) Which part of the molecule gives it **acidic** properties?

[1]

.....

(c) Which part of the molecule gives it **basic** properties?

[1]

.....

(d) How does one amino acid differ from another? [1]

.....

(e) (i) Two of the molecules shown in the diagram can join together. Draw a diagram below to show the products formed when two such molecules link. [2]

(ii) What type of chemical reaction is involved? [1]

.....

(iii) State the name of the bond formed between the two molecules. [1]

.....

(Total 8 marks)

3. The genetic code contained within DNA determines the sequence of amino acids in a protein. Each amino acid requires a triplet code of three bases.

(a) (i) How many different types of amino acid are used in protein synthesis? [1]

.....

(ii) Explain why there must be three bases in each code. [2]

.....

.....

.....

Turn over.

- (b) The table shows some of the base sequences of mRNA together with their corresponding amino acids.

<i>mRNA triplet</i>	<i>Amino acid</i>
UUU	phenyl alanine
CUC	leucine
AUG	methionine
UAU	tyrosine
CGU	arginine
GAU	aspartic acid
GUU	valine
GAA	glutamic acid
AGU	serine
ACC	threonine
ACA	serine
GAC	aspartic acid
UAG	stop code













A section of mRNA produced in the nucleus of a cell is shown below.

A U G G U U G A A G A U G U U G A C

- (i) Using the information given in the table write out the sequence of amino acids for which the section of mRNA codes. [3]
-
-
- (ii) Write the base sequence for the DNA template from which the strand of mRNA was produced. [3]
-
- (iii) State the name of the process occurring in the nucleus that gives rise to this strand of mRNA. [1]
-

(Total 10 Marks)

4. Genetic fingerprinting is a technique that allows a genetic analysis of an individual. As a result of the analysis the DNA of the person is displayed as dark bands. The diagram shows the bands obtained from a father, mother and four children.

Child 1	Child 2	Mother	Father	Child 3	Child 4
					
					
					
					

- (a) Which children are the biological offspring of these parents? [1]

.....

- Which children are **not** the biological offspring of these parents? [1]

.....

- (b) Give the reasons for your answers to part (a). [2]

.....

.....

.....

- (c) State **one other** use of genetic fingerprinting. [1]

.....

(Total 5 Marks)

Turn over.

5. An investigation was carried out to monitor the course of an enzyme catalysed reaction in which the hydrolysis of a lipid (fat) occurred. A pH meter was used to follow the progress of the reaction.

(a) (i) State which type of enzyme would have been used. [1]

.....

(ii) Explain what is meant by the term *hydrolysis*. [2]

.....

.....

(iii) What changes to pH would have been recorded by the pH meter during the reaction? [1]

.....

Explain why these changes occurred. [1]

.....

.....

.....

- (b) This investigation was repeated several times using the same concentration of enzyme, but a different concentration of the lipid each time. The time taken for the pH meter to record no further change in pH was recorded and the rate of reaction at each lipid concentration was calculated. The results of each experiment are set out in the table below.

<i>Lipid concentration/%</i>	<i>Rate of reaction/ arbitrary units</i>
0.1	0.6
0.2	1.3
0.3	1.9
0.4	3.0
0.5	4.0
0.6	4.8
0.7	5.8
0.8	5.8

- (i) Plot the results of the investigation on the graph paper below.

[3]



- (ii) What happens to the rate of reaction when the lipid concentration rises from 0.7% to 0.8%? Explain your answer. [2]

.....

.....

.....

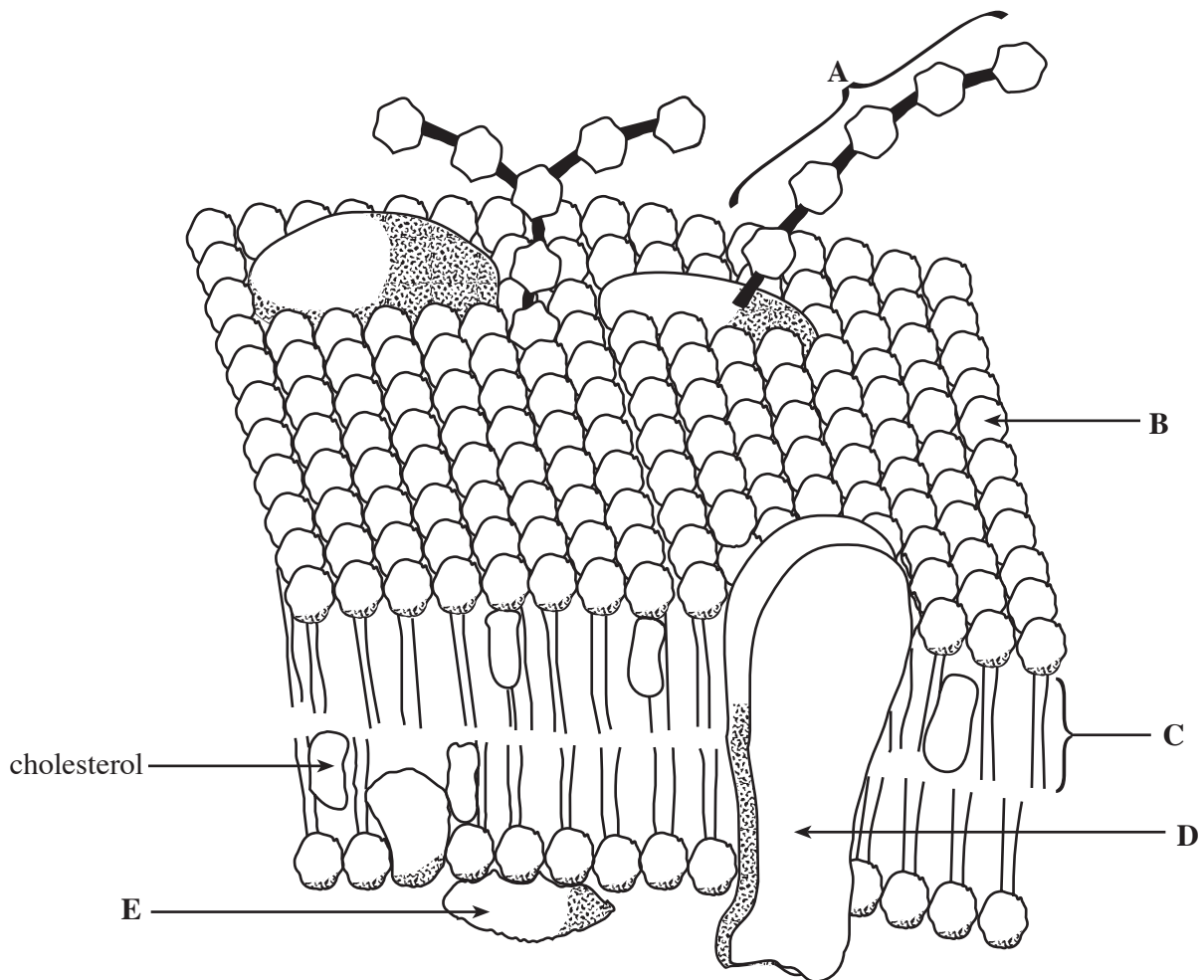
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- (iii) The investigation was performed at 25°C. Draw a second line on the graph to show the expected results if the experiment had been carried out at 35°C. Label your line 35°C. [1]

(Total 11 Marks)

Turn over.

6. The diagram shows the plasma membrane of an animal cell.



With reference to the diagram.

- (a) (i) State the names of the structures labelled A to E.

[5]

- A
 B
 C
 D
 E

(ii) State the name given to this model of membrane structure.

[1]

.....

- (b) Glucose and vitamin A are molecules that enter a cell by passing across the membrane. Glucose is water soluble and vitamin A is fat soluble.

Explain how the properties of the molecules and the structure of the membrane determines the way in which these two substances pass across.

Glucose

[2]

.....

.....

.....

Vitamin A

[2]

.....

.....

.....

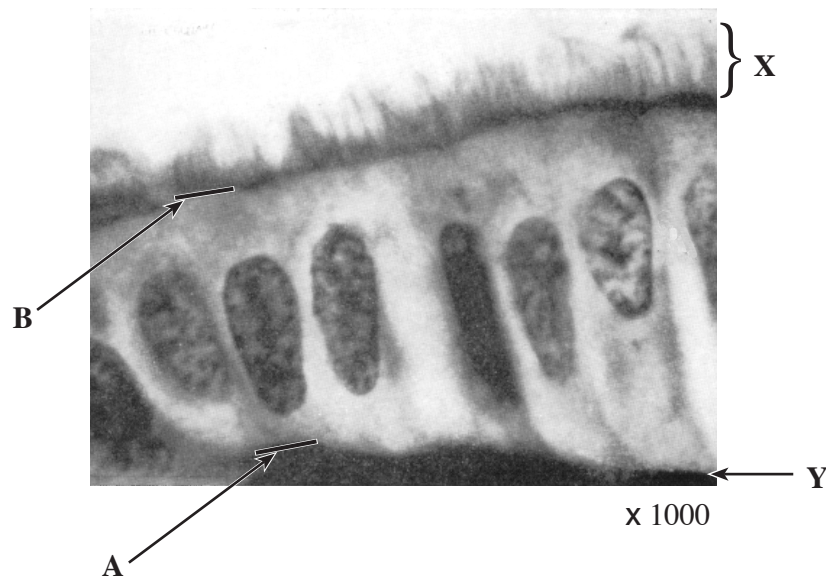
- (c) Name **two other** methods by which substances cross the plasma membrane.

[2]

.....

(Total 12 Marks)

6. The diagram shows an epithelium found in a mammal.



- (a) State the type of microscope used to view the epithelium preparation. [1]

.....

- (b) Name the parts labelled **X** and **Y** on the diagram. [2]

X

Y

- (c) Such cells are found in the trachea. Explain how the structure of the cells is related to their function. [2]

.....

- (d) Calculate the actual height of the cell shown between the lines labelled **A** and **B**. Show your working. [2]

.....

- (e) State what is meant by the term *tissue*. [2]

.....

(Total 9 Marks)

Either, (a) Describe the stages in the process of mitosis. [10]

Or, (b) Describe how genetic engineering can be used to produce human insulin. [10]

[illegible]

[illegible]

(Total 10 marks)